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Proceedings of a Maritimes Regional Advisory Process Meeting on LFA 33 – 41 Lobster

2 – 5 April 2001
Mic Mac Amateur Aquatic Club
Dartmouth, Nova Scotia

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FOREWORD

The purpose of this proceedings is to archive the activities and discussions of the meeting, including research recommendations, uncertainties, and to provide a place to formally archive official minority opinions. As such, interpretations and opinions presented in this report may be factually incorrect or mis-leading, but are included to record as faithfully as possible what transpired at the meeting. No statements are to be taken as reflecting the consensus of the meeting unless they are clearly identified as such. Moreover, additional information and further review may result in a change of decision where tentative agreement had been reached. Therefore, only the Stock Status Report(s), which contain the consensus decisions of the meeting, should be used as sources of information on the status of the resource assessed. Additionally, any summary on the stock status presented in this proceedings should not be referenced. The Stock Status Reports are supported by Research Documents which will be finalized from the working papers presented at the meeting.

Avant-propos

Le présent compte rendu fait état des activités et des discussions qui ont eu lieu à la réunion, notamment en ce qui concerne les recommandations de recherche et les incertitudes; il sert aussi à consigner en bonne et due forme les opinions minoritaires officielles. Les interprétations et opinions qui y sont présentées peuvent être incorrectes sur le plan des faits ou trompeuses, mais elles sont intégrées au document pour que celui-ci reflète le plus fidèlement possible ce qui s'est dit à la réunion. Aucune déclaration ne doit être considérée comme une expression du consensus des participants, sauf s'il est clairement indiqué qu'elle l'est effectivement. En outre, des renseignements supplémentaires et un plus ample examen peuvent avoir pour effet de modifier une décision qui avait fait l'objet d'un accord préliminaire. Par conséquent, ce sont uniquement les Rapports sur l'état des stocks, reflétant les décisions consensuelles prises à la réunion, qui doivent être les sources de renseignements au sujet de l'état des ressources évaluées. Les brefs sommaires de rapport sur l'état des stocks présentés dans le présent compte rendu ne doivent pas non plus être considérés comme des textes de référence. Les Rapports sur l'état des stocks sont appuyés par les Documents de recherche, qui seront établis définitivement à partir des documents de travail présentés à la réunion.

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ABSTRACT

A RAP meeting to review the status of LFA 33 – 41 lobster was held during 2 - 5 April 2001 at the Bedford Institute of Oceanography. Follow-up meetings to finalise the Stock Status Reports were subsequently held on 27 April and 8 August. The RAP produced Stock Status Reports for LFAs 34 and 35-38 lobster for use in management for the 2001/2002 fishing year. Recommendations were also made to improve future assessments.

RÉSUMÉ

Une réunion du PCR ayant pour but d'examiner l'état des stocks de homard des ZPH 33 à 41 a eu lieu du 2 au 5 avril 2001 à l'Institut océanographique de Bedford. Des réunions de suivi ont été tenues par la suite le 27 avril et le 8 août pour mettre la dernière main aux Rapports sur l'état des stocks de homard des ZPH 34 et 35-38 devant servir à la gestion pour l'année de pêche 2001-2002. Des recommandations en vue d'améliorer les évaluations futures ont également été présentées.

INTRODUCTION

Three RAP meetings were held during April – August 2001 to consider issues relating to the lobster resources in LFA 33s – 41. The main meeting was held 2 – 5 April 2001 in the Mic Mac Amateur Aquatic Club, Dartmouth, N.S. Follow-up meetings (conducted by teleconference) were required on 27 April and 9 August to finalize the Stock Status Reports (SSR) of LFA 34 and LFA 35 – 38 lobster respectively. The participants in these meetings are given in appendix 1, with the letter of invitation in appendix 2. At the main meeting, the chair, R. O'Boyle, noted that the last time that the status of LFAs 34 and 35 – 38 lobster was considered was in July 1998. It was noted that these meetings were to determine stock status and were not to discuss management – related issues. He pointed out that the results of the meeting were confidential until the SSRs were made public.

The terms of reference and meeting agenda of the RAP are given in appendices 3 and 4 respectively. A list of the documents tabled during the RAP is given in appendix 5. About one week prior to the main meeting, the working papers had been distributed to three external reviewers (Marc Lanteigne, Carl Wilson and Paul Rago). At the main meeting, the senior author of each working paper made a presentation, following which there was discussion, recorded by an assigned rapporteur. The reviewers were then given the floor to ask questions after the presentation, following which the discussion was opened to all participants. These reviewers were asked to summarize their observations of the RAP, which is given in the last section of the proceedings. The research recommendations emanating from these discussions are summarized in appendix 6.

Throughout the RAP, comments were received from industry. First, a series of preparatory meetings were held with industry, which are documented in appendix 7. During the main meeting, some industry participants provided comments (appendix 8) while subsequent to the 27 April teleconference, further comments were received (appendix 9).

REPORT OF ZONAL LPA WORKSHOP

Presenter: R. Claytor
Rapporteur: R. Claytor

Background

This report outlines the conclusions and recommendations of a workshop (20 – 21 March 2001) attended by lobster resource managers and assessment scientists. There were two objectives for the workshop. First, develop criteria and data requirements for defining geographic assessment and management units and second, develop a modeling framework for assessing the impact of diverse fisheries within these units. Management units are well defined by Lobster Fishing Areas (LFA) and generally correspond to geographic areas with common fishery regulations. Geographic assessment units, commonly referred to as a Lobster Production Areas (LPAs), are ideally defined on the basis of biological characteristics.

Currently there is no uniform application of an LPA definition in lobster stock assessment or management.

An attempt at defining these was made by the FRCC in 1995. There is, however, disagreement on the appropriateness of the boundaries identified by the FRCC and they are not used as the basis for assessment of the lobster resource. A meeting (Dec. 1995, CLAWS,) of regional lobster assessment biologists produced a working definition of LPA and identified several projects that would help to make the definition operational. This group defined an LPA as one or more self-sustaining lobster populations that were linked by sufficient interchange so that the catch, recruitment, and abundance of these populations influenced each other.

We began by recognizing that management and assessment units, while each having a geographic basis, will often have different boundaries. LPAs would be defined by the contrast between adult migration and larval drift which create linkages between lobster populations, and the fidelity to spawning location and differences in abundance of spawners, which would tend to create boundaries between lobster populations. In contrast, fisheries management units tend to be based on concerns such as markets, historical effort, and weather conditions (e.g. presence of ice). In the last several years, aboriginal fishing has focussed management concerns on smaller spatial scales. As a result, fisheries management usually occurs on the same or smaller scale than an LPA.

Evaluation of the current four-year plan requires a uniform definition and application of LPAs. If during a full evaluation of the current four-year plan, it is determined that not all fisheries have responded similarly, it will be important to determine if these dissimilar responses are the result of unaccounted for population linkages. Future assessment and management of the resource also depends on appropriately defining LPAs because lobster fisheries are becoming more diverse as aboriginal fisheries develop and commercial fisheries expand into previously non-exploited areas. Successfully incorporating these diverse fisheries into conservation and management plans requires an assessment approach that identifies fisheries as part of specific sets of population(s) that require conservation. Thus, we have a short term and long-term need for addressing the question of LPA definition.

Current Assessment and Management

Fisheries resource management and science representatives made presentations regarding current approaches to assessment and management in each of the Atlantic regions. The presentations indicated the extent to which different approaches were used in the management and assessment of lobster fisheries among the regions. Newfoundland LFAs are managed separately but the egg / recruit target is evaluated over all LFAs, by treating the Newfoundland Region as an LPA for assessment purposes. Laurentian region management is on a small scale, often dividing LFAs into smaller units. Targets are measured against LFAs. In contrast to other areas, where the smallest molt group in the catch makes up 70-85% of the catch, Anticosti Island was identified as the area of Atlantic Canada with a low exploitation rate and several molt groups contributing to the catch. Gulf Region fisheries are managed on an LFA basis. There are differences in the minimum legal size (MLS) among LFAs and there

is often difficulty in justifying these differences. The egg / recruit target is evaluated treating the entire Gulf Region as an LPA. The Maritimes Region has evaluated the egg / recruit target on an LFA basis. Linkages between populations are known to occur but the boundaries of these populations and the strength of the linkages are uncertain.

Current Modeling Frameworks

A genetics model is currently being developed in collaboration with the DFO and Dalhousie University. One outcome of this model will be to produce estimates of population exchange that can be compared to those determined from expectations arising from adult tagging studies and larval drift modeling. Models predicting the destination and origin of larvae found in offshore German, Browns, and Georges offshore banks indicate that at least some of the larvae found on Georges Bank originate from outside Canadian waters. Once on Georges Bank larvae tend to remain there. Larvae originating from Browns and German Bank contribute to inshore populations north of Lobster Bay and into the Bay of Fundy. An examination of current and past field experiments on larval drift and survival and historical catch trends indicate that western LFA 33, eastern LFA 33 to 27, and at least part of LFA 27 may form different LPAs. Precise boundary locations differ depending on the data sets used. A spatial model that incorporates seasonal changes in catchability and expected effort re-distribution as a result of management changes has been developed for the Magdalen Islands. This model was designed to be transferable and likely has applications in other areas. The Gulf Region is developing a model to investigate the effects on the fishery of an expanded season in response to aboriginal fishery patterns. A fine grid spatial catch monitoring system has been developed in LFAs 34-38. Data collected in this system is in the form required for predicting spatial changes in effort as management options are varied. Newfoundland Region was the only region to have experience with inshore closed areas and developing models to specifically predict the effects of v-notching on meeting the egg / recruit target. These presentations indicate that appreciable progress has been made in developing the spatial models and data that are required to evaluate fishery effects on LPA populations.

Table 1. Common criteria for defining linkages of populations that can be grouped in to LPAs.

Criteria	Zonal review	Knowledge Gap	Issue
Size at maturity	Yes	High	Affect of measurement method on producing differences, Variability or uncertainty effects on boundaries
Inshore larval drift	Yes	High	May have high impact on linkages, standardizing method important
Adult movement	Yes	Low	Local, with the exception of the Gulf of Maine, generally well known but important
Benthic production – Juvenile survival	Yes	High	May affect spatial scale for appropriate definition of egg / recruit, standardizing method important
Molt frequency		Low	Generally well known and predictable
Dynamics of recruitment processes	Yes	High	What are spawning sources, where do eggs recruits go, map berried females
Larval survival	Yes	High	May affect spatial scale for appropriate definition of egg / recruit, standardizing method important
Environmental interactions		Low	Affect growth rates, size at maturity, catchability
Genetics		High	Work assessing utility in progress
Fishery aspects - catchability		High	Some components of the lobster populations are less catchable than others. Is this important to our measures of exploitation? How does the fishery change the population structure
Refuges		High	Do spatial or seasonal refuges protect populations within LPAs

LPA Definition Criteria

We reviewed a number of criteria for defining LPAs. These included larval drift and adult migration, which directly create linkages as well as identifying spawning sources and densities, which create boundaries. We also identified a number of biological characteristics that would be indicators of population structure rather than creators of structure. We have organized these as a table. We have indicated the relative level of the knowledge gap in these items. In addition, we have identified specific criteria whose methodology needs to be reviewed before their utility in defining LPAs will be known (Table 1). Six of these criteria have been identified for a zonal assessment review in the summer of 2002. These are: (1) mapping location of breeding females and recruitment, and (2) estimating exchange rates based on adult migration and standardizing methods for estimating (3) size-at-maturity, (4) larval survival, (5) juvenile survival, and (6) larval drift models.

Modeling Approach

Participants agreed that the development of a model that would standardize the approach for evaluating the impact of management options on the fisheries within an LPA would be an indispensable tool in two respects. First, it would identify the relative effects of aboriginal and commercial fisheries on local populations. It was concluded that this type of modeling could be done relatively quickly and if begun immediately could be in place to solve management and assessment questions by the fall. Second, a more general model that could be applied over the range of fisheries and LPA structures that would exist zonally is essential for moving forward with the second phase of a lobster conservation plan. This more general model would take longer (1 – 2 years) to develop.

Workshop Recommendations

The following recommendations were made at the workshop:

- Conduct a zonal assessment meeting in the summer 2002 to review:
  - Status of four-year plan
  - LPA criteria
  - Spatial management model

- Support a project to develop a spatial management model

LFA 33: STOCK STRUCTURE

Working Paper: Claytor, R., S. Nolan, and R. Duggan. 2001. Associations among LFA 33 Lobster Fisheries. RAP Working Paper 2001/31.

Rapporteur: A. Reeves

Abstract

The associations among port clusters in LFA 33 was examined using catches from 1989-1999 as compiled from purchase slips and mandatory logs, catch rates from voluntary logbook fishers, and length frequencies from port sampling. These analyses indicated that port clusters 1-5 and 8-13 form separate cohesive groups, while port clusters 6-7 are intermediate. This result is in general consistent with other research by Campbell and Mohn (1983), Campbell (1989), and Miller (1997). Each of these studies found the western most portion of LFA 33 to be distinct from the eastern most with the central portion intermediate.

Correlations among the port clusters for catches indicated that port clusters 1-5 and 8-13 formed two groups of associated port clusters with 6 and 7 being intermediate for both the spring and fall portions of the fishery. The only port clusters where fall landings and spring landings were associated were port clusters 6 and 7. Port clusters were grouped into 1-4, 5-9, and 10-13 for catch rate analysis based on voluntary logbook reports for the fall and spring

portions of the season. Catch rates in each of these three areas increased appreciably during the fall season in each of the groups. All three groups were correlated for fall season for the years of common data collection. Catch rates during the spring portion of the fishery were much lower than the peaks observed in the late 1980's in port clusters 1-9 but these differences were not statistically significant. Spring catch rates in port clusters 10-13 were the highest since 1994 but were not statistically different. There were very few correlations among the port clusters for mean lengths of males and females.

Presentation Highlights and Discussion

Correlations among port clusters and port cluster groups were used to determine associations among groups of ports in LFA 33. Fall and Spring catch correlations indicate an association among port clusters 2-5 and 8-13. Port cluster 1 does not have strong associations with any other port cluster. Port clusters 6 and 7 appear to be an intermediate group. Fall CPUE correlations among groups of port clusters indicate that CPUE is positively and significantly correlated among the three groups consisting of port clusters 1-4, 5-9, and 10-13. Remaining to be done for this analysis is an analysis of spring CPUE, spring length frequency sampling, sea sampling spring and fall, and a summarization of industry workshops held in February 2001.

The season for LFA 33 is the last Monday in November to May 31. The majority of the fishing takes place nearshore. The minimum size in 2000 was 82.5 mm CL. LFA 33 has been divided into port clusters (loosely corresponding to statistical districts in most cases) by management and industry, but management plans do not differ among the clusters. Effort in terms of fleet size is greater in the fall (average 725 boats from 1996-1999) than in the spring (600 boats). *It was noted that some of the numbers of boats indicated per port cluster (Table 1) may be inaccurate and an examination of the data collection methods for this information should be undertaken.* Port clusters 3, 4, 9, 10, and 11 account for most of the fleet effort. The number of boats in the fall fishery has decreased in recent years. Average landings per boat are higher in the fall. Landings are lower in port clusters 1-6 compared to port clusters 7-13.

Three main criteria were used to determine associations or common trends among port cluster groups (in bold below).

Landing correlations among port clusters, with respect to fall and spring, were examined using the corrcoef Matlab function. Fall landings show significant correlations among port clusters 2-5, and between port clusters 8 and 9-13. Fall landings from port cluster 1 were not significantly correlated with any other port cluster. For spring landings, there are more significant correlations among the block of port clusters from 7-13 than from 1-6. For port clusters 1-6, the significant correlations tend to be between neighbouring port clusters rather than in blocks. Significant correlations between fall and the following spring catches within each port cluster was only found for port clusters 6 and 7. These results tend to suggest an association among port clusters 2-5 and 8-13. Port cluster 1 seems to be different than most other port clusters and port clusters 6 and 7 are intermediate. The data for these analyses came from mandatory logs.

Catch per unit effort (CPUE) information comes from voluntary logbooks kept by interested fishers which contain daily catch and effort data for the fall and spring seasons. This is generally considered as the *'best available data'*. A multiplicative analysis with fisher, week, and year factors was performed separately on each of three sets of port clusters (1-4, 5-9, and 10-13) and used to derive annual indices of CPUE for each of the sets. All main effects were significant in each area. Thus far the analysis has been completed for the fall season, which indicates the CPUE has increased since 1994 for each set. For port clusters 1-4, the 1999 CPUE was significantly greater than most of the years from 1988-1996 and highest in the time series, although not significantly different from 1986. For port clusters 5-9, 1999 CPUE was significantly higher than 1988-1998, and not the highest in the time series or significantly different than 1984. For port clusters 10-13, 1999 CPUE was significantly higher than 1994-1998 and the highest in the time series but not significantly higher than 1993. Correlations were significant among all pairs of port clusters groups for fall CPUE.

Length frequencies have been collected since 1984 from port and sea samples but an analysis of trends remains to be completed. A preliminary examination of port sampling suggests the animals landed in the fall are mostly from the first molt group and that the spring samples show more large animals and has greater year to year variability. Very limited sea sampling occurred during the 2 off-season aboriginal fisheries and suggests higher CPUE than the fall fishery and total catches could be in the order of 3000 to 3500 lb.

Recommendations

A research recommendation suggested during this meeting would be to compare the results of the analysis from the western portion(s) of LFA 33 to that of LFA 34.

LFA 31-33: QUALITY OF FISHING EFFORT DATA

Working Paper: Duggan, R.E. 2001. Lobster Fishing Effort on the Outer Coast of Nova Scotia: 1983 versus 1998. RAP Working Paper 2001/29.

Rapporteur: R. Miller

Discussion

- Add to methods section the number of interviews conducted in the 1980s, the percentage of licensees interviewed and more details of questions asked.
- Perhaps in the future, fishermen selected for interviews should be stratified by age. Age may affect the technology and fishing strategy.
- Is the change in catch since the 1980s due to change in effort or stock abundance? It must be due to abundance because exploitation rate and fishing area is about the same.
- Are changes in fishing methods adopted to keep up with the neighbours or for economic benefit? Presumed to be some of both plus reduction of work (wire traps and fibreglass boats) and increased safety.

- Incentives for purchasing a new boat are tax deductions from capital depreciation and port regulations prohibiting docking of gasoline powered boats.
- Did the number of active licenses increase from the early 1980s till the present? Most inactive licenses were sold back to the government in 1978-81, however licenses may now be active for more of the season than previously because of reduced groundfish fishing alternative.
- The greatest effect improved fishing technology has on the stock may be the exploitation of small areas that were formerly spatial refuges. This is make possible by colour sounders to locate habitat, GPS to record its location, and bigger-faster boats to range further from port.
- We don't have a good history of technology changes in this fishery, but there was no agreement on whether it was needed.

INTERACTION OF CATCH RATES AND TEMPERATURE

Working Papers: Claytor, R. 2001. Adjusting Lobster CPUE Trends for Temperature Effects. RAP Working Paper 2001/36.

Rapporteur: S. Smith

Presentation Highlights

A data set consisting of daily counts of sub-legal lobsters returned after trapping and legal sized lobsters removed from each fishing day was used to investigate a method for estimating relative exploitation rates in six sub-areas of Lobster Fishing Areas (LFAs) 33 and 34. This data set is part of a broad geographic scale project sponsored by the Fishermen Scientists Research Society (FSRS).

A key question in almost all stock assessments concerns the relative importance of the environment and fishing on population changes. Changes in populations are often evaluated using catch rates. Changes in catch rates are the result of change in numbers of fish as well as changes in the environment. Leslie depletion estimators have often been used to estimate exploitation rate in lobster assessments. These are criticized because one the principal assumptions, constant catchability, often does not appear to be met. This failure can severely bias results concerning exploitation rates. Catchability of lobster has been found to be directly proportional to temperature between 0 – 10°, with catchability increasing as temperature increases. In fall fisheries, temperature declines as the season progresses so catch rates are high at the beginning of the year because of abundance and drop during the year due to depletion. However, high temperatures also occur at the beginning of the year and decrease as the season progresses. This results in higher than expected catch rates when the season starts and lower than expected catch rates by the end of the season and causes exploitation rates to be over-estimated. One way to separate temperature and fishery effects on declining catch rates would be to measure catch rate changes in a portion of the population that is not being depleted while simultaneously, measuring catch rates in a portion of the population that is being depleted. The FSRS recruitment data set offers such an opportunity.

Participants in this project fish two to three traps each time they go fishing. All lobsters caught are measured and sex is noted. The traps are of a standardized size and have no escape vents. The data were divided into six areas from LFA 33 and 34 for this study. Only data from the fall 1999 was examined and only male sub-legals < 81 mm and legals 81-90 mm carapace size were examined.

The objective of the study was to partition the variation in slopes between the sub-legals and legals using analysis of covariance. This partitioning would identify the portion of the variation in the legal cpue decline that resulted from fishing versus temperature effects. It was hypothesized that the proportion of the decline in legal cpue that resulted from fishing would be a relative index of exploitation rate.

A few simple tests using Paloheimo's model that directly incorporates a linear effect of temperature on catchability was used to determine if this approach was feasible. The model was Cpue = q(N-K), where $q=q_{ref}(T - T_{ref})$. A range of q_{ref} were examined so that exploitation rate varied from 24% to 99%. The proportion of the slope due to fishing effects in legals increased with exploitation rate in this test.

As a result, the analysis was extended to the FSRS trap data and analysis of covariance was used to identify significant differences among intercepts and slopes for the two groups by area. This analysis indicated a range of results, from declines in legals resulting entirely by fishing (Area 2), a mixture of fishing and temperature (Areas 1,3,5), and from exclusively temperature (Areas 4 and 6). The index of exploitation rate described above indicated a five-fold range in exploitation rates among these areas. This was in contrast to previous exploitation rate estimates that do not take into account temperature effects. An analysis to estimate q_{ref}, T_{ref}, and N by minimizing the sum of squares residuals indicated a two fold difference in exploitation rate among the areas.

The analysis of covariance results are not sensitive to variation in q_{ref} between the depleted and non-depleted groups. Differences in T_{ref} between the groups or among years examined would have an appreciable effect on the analysis unless comparable data was collected each year. As long as data is collected simultaneously from depleted and non-depleted groups these effects can potentially be accounted for. This approach also appears to permit changes in cpue to be evaluated for high temperature compared to low temperature years provided data is collected simultaneously.

These results indicate that this approach may provide a method for tracking relative changes in exploitation rate in lobster fisheries. There is, however, a requirement to conduct annual trap monitoring experiments where the catches and effort on all size groups can be simultaneously recorded. Additional work is required to provide more rigorous tests of the sensitivity of the results to the assumptions such as the linear relationship between catchability and temperature, a constant reference temperature among years and size groups, and how to incorporate variance estimates into the exploitation rate index and subsequent advice. These results will be important in determining the utility of broad scale trap monitoring programs for the assessment of lobster fisheries.

Discussion

Daily lobster catch and temperature data collected by the Fishermen Scientists Research Society (FSRS) for its recruitment index were analyzed using a depletion method (Leslie model) to determine the relative importance of the environment and fishing on population change. Past studies have indicated that lobster catch rate generally declines with decreasing temperature but it has been difficult to disentangle the effects of fishing and temperature on trends in catch rates. Catch rates from the fishery have been used to estimate exploitation rates assuming no effects of temperature. In the FSRS study the traps are designed to catch both legal sized and sublegal sized lobsters. The method presented compared the decline in catch rates over time between these two size groups with the assumption that changes for the sublegals was due to temperature alone. The analysis was restricted to data from the fall of 1999 and showed that the relative contribution of fishing and temperature change varied throughout the areas studied (LFA 33 and 34).

In general, the method was judged to be useful and further study was encouraged. The method was not being used in the stock assessments presented at this meeting.

Recommendations

A number of potential research recommendations were suggested:

- The analysis should be extended to the whole fishing season and especially to the last two weeks of the season in the spring when temperatures are increasing.
- The analysis assumed that the critical temperature when lobsters became active was the same for all size groups. Observations from fishermen indicated that this was probably not correct and more work needs to be done on defining this temperature for the size groups in the study. The study had also included all sizes of sublegals and the suggestion was made that the analysis be restricted a smaller size range close to the upper limit of this size class.
- The method assumes that the population in the area is closed to immigration, emigration and mortality during the period analysed. Further the method assumes that declines in the catch rate by the fishery are the same as measured by the cumulative catch in the traps dedicated to the FSRS recruitment index which are fished in a fix location. The robustness of the method to violations of these assumptions needs to be evaluated.
- There is a possibility that due to interactions between sublegal and legal sized lobsters the catchability of the former size group would increase as the latter size group are depleted. The effects of this potential interaction on the analysis needs to be evaluated.

LFA 34 AND 41: SPATIAL ANALYSIS

Working Paper: Pezzack, D.S., C.F. Frail, P. Lawton, M.B. Strong, D.A. Robichaud, and P. Carroll. 2001. Spatial Patterns in landings, effort, and moth groups in Lobster Fishing Areas 34 and 41 during the 1998/99 and 1999/2000 fishing seasons. RAP Working Paper 2001/27.

Rapporteur: C. Frail

Discussion

It was felt that the methods used and data available was a tremendous advance in looking at the fishery. The question was posed as to whether the results presented agreed with what industry has observed. Industry agreed this is what they have observed.

Industry suggested the advantage of using the Thistle Marine electronic logging system and that it provides additional information on the fishery.

Out of 90+ sea samples, only ~300 berried females were measured. It was questioned if this was a result of the time of the year the samples where taken. It was agreed that this might be a problem. The Thistle Marine log may remedy this. As well, information could be collected from the lobster pounds about the condition/size of lobsters coming in. Industry expressed their interest in playing a role in this type of data collection.

Midshore expansion was discussed and it was suggested that the previous level of fishing in the midshore, assessed by fishermen interviews, may not be as accurate as thought. The current estimate of landings in the midshore is of 9.4% of the total LFA 34 landings where as the previous estimate was 20-30%. It was suggested by industry that it may be dangerous to make conclusions about shifts of landings to and from the midshore from only two years of logbook data. Industry said that in the current season there has been a significant shift towards the midshore again. As well, it was indicated that the size of the animals has changed significantly as well. Reviewers suggested that maybe these early estimate were accurate and there has been a shift in recent years. As well, it was stated that the fishermen interviews initially indicated a midshore estimate of 10% of the total landings but this was later bumped up when industry said that the landings had doubled or even tripled in the years following the interviews. The possibility of unknown effort in the midshore due to foreign vessels prior to the ICJ decision was also discussed.

CPUE was calculated for each grid grouping from the logbook data. CPUE was also calculated for four transects running from various inshore locations to offshore. It was questioned as to why the two methods showed different results. The group method showed constant CPUE while the transect method showed variability. This was due to data from LFA 41 being included for the transect method so the variability of CPUE could be observed from inshore to offshore areas outside of LFA 34.

To better understand removals and allow comparisons between areas, the size frequency data was expanded by the logbook landings to give an estimate of numbers landed at size. It was questioned whether this would bias the estimates toward the legal catch. It is suggested that the fishermen target the legal lobsters. The goal of the sea sample vs. the port sample is to find out about the sublegals. Maybe the sea sampling distribution should be independent of what the landings indicate the level of fishing is. In addition to sea sampling data (fishery dependant), independent data from US trawl surveys, scallop surveys, and Canadian trawl surveys is available. The Canadian trawl survey is now collecting data on lobsters.

Recommendations

- Survey within the Brown's Bank closed area.
- CPUE calculation for the entire LFA 34 shown as a centre of concentration and the decrease as a radiation from the centre.
- New columns in logbook: number of berried females caught and number of v-notches caught.
- ANOVA on logbook data with area/depth/time etc. showing interactions controlling catch rates and possibly suggesting how to group the grids.

LFA 41: CATCH RATE ANALYSIS

Working Paper: Claytor, R., D. Pezzack, C. Frail, and K. Drinkwater. 2001. Analysis of LFA 41 Lobster Catch Rates 1985 – 2000. RAP Working Paper 2001/30.

Rapporteur: D. Pezzack

Presentation Highlights

Analyses of annual trends in LFA 41 catch rates was presented by area and fall and spring portions of the season. The five areas examined were: Crowells Basin, SW Browns, Georges Basin, SE Browns, and Georges Bank.

Each analysis proceeded as follows:

First, the analysis was run with the main effects as year and 14Day Weeks using all years 1985-2000. This analysis was consistent with that done in the Feb. 2000 assessment. Second, only the years 1994-2000 were examined but the main effects were year, 14DayWeek, percentage of crab in the trip, and captain but only using the three consistent captains. The years 1994-2000 were examined separately because of the changes in the fishery as described above that occurred in these years. That is these are the only years with crab catches and no regulated trap limits. The catch rates from the shorter 1994-2000 series were compared to those from the longer series to determine the effect that crab and captain changes had on the annual standardized catch rates.

Catch rates for 1985-2000 and for 1994-2000 were compared among all areas using linear regression. This analysis was done to determine which areas had similar trends in catch rate for the complete time series and for the portion of the time series with the most reliable effort data. The analysis was done separately for the fall – winter and spring – summer time periods. A p-value of 0.05 was considered significant for these analyses.

A preliminary examination of temperature effects was made by comparing catch rates for Area 1 to mean temperatures from the nearest temperature stations for October and November for all years available. Monthly catch rates were calculated using data from all trips, including crab directed trips, and all captains. Catch rates were calculated by summing the catch and effort (number of hauls) for these months for each year. Relationships were examined for the years 1985-1999 and for 1994-1999 to be consistent with the analysis of the CPUE described above.
All Fall – Winter models were significant for year and 14DayWeek effects for all areas. For the shorter time series, captain effects were significant for all areas except Georges Bank, area 5. Percentage of crab in the catch was not significant in any area.

All Spring – Summer models were significant for year and 14DayWeek effects for all areas in the 1985-2000 time series. Crab effects were not significant in any area for the short time series. Captain effects were significant only for area 4. In area 1 only one of the three major captains had fished during the spring.

Cpue time series from the long time series using year and 14DayWeek main effects were significantly correlated with shorter time series cpue's that incorporated significant captain effect.

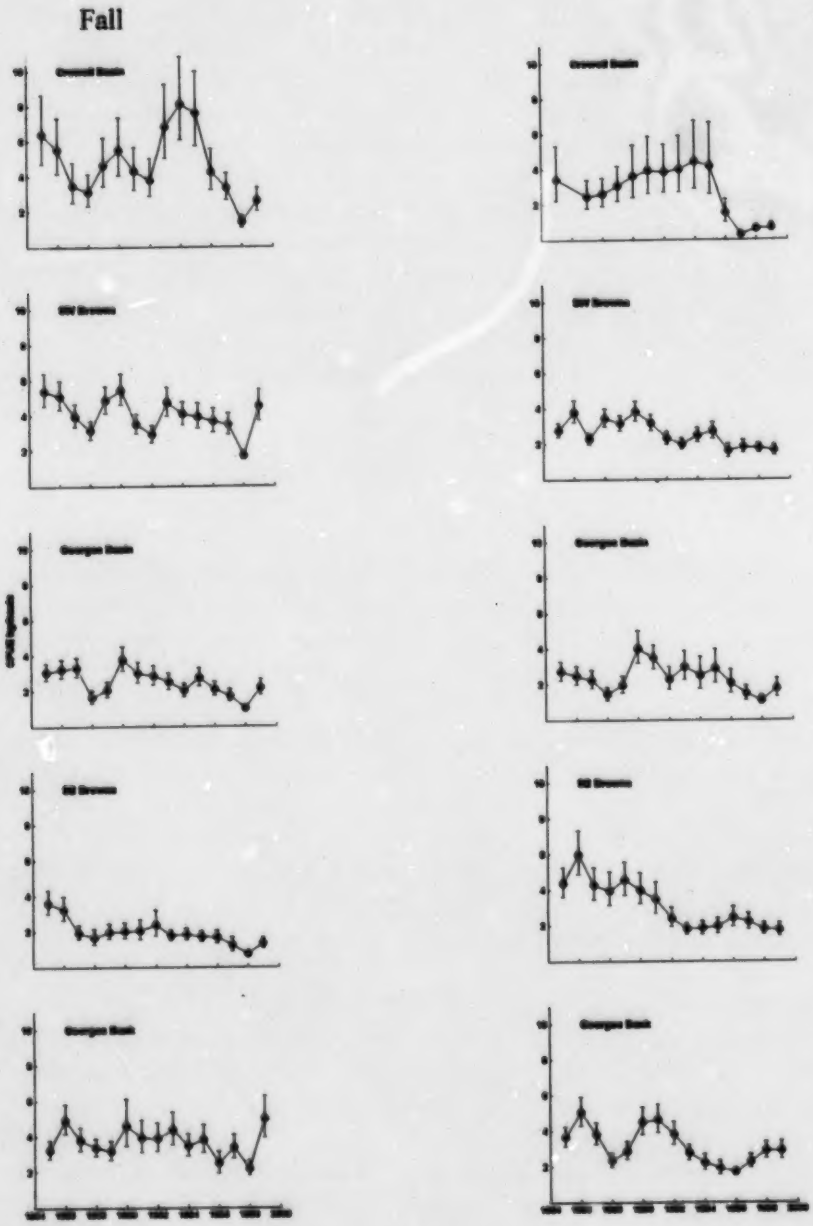
For the fall, catch rates in all areas were significantly higher in 1999-2000 than in 1998 – 1999. For areas 1 and 4 they were still below the peak levels achieved in 1994-1995, but for areas 2, 3, and 5 they the highest estimated in recent years.

For the spring, catch rates were higher in 1999-2000 than in 1998-1999 for areas 1, 3, and 5 but none of these were significant and in all areas catch rates were still below peak values. Catch rates between the short and long time series were significantly correlated for areas 1 and 4. For the other areas neither crab nor captain effects were significant.

Area correlations in catch rates indicated that Crowells Basin was not correlated with Georges Bank but that the other areas were intermediate.

For October and November, temperatures at 30m did not have correlation coefficients that were above 0.75 with those at any other depth. In contrast, temperatures at 100m had correlation coefficients that were above 0.75 with all depths except 30m. As a result, mean monthly temperatures at 30m and 100m were compared to catch rates for the appropriate month.

Only the relationship between catch rate and temperature at 30m for the 1985-2000 October relationship was significant ($p<0.01$).



Fall and spring catch rates for five LFA 41 offshore assessment areas. Note there was no data related to catch rates in Crowell Basin for the spring of 1986.

Fall catch rates in kilogram per trap haul (kg/th) of the five assessment areas.

Area	1994-1998	1998-1999	1999-2000
Crowell Basin	8.20	3.09	5.99
SW Browns	3.93	1.57	4.40
Georges Basin	2.12	1.46	2.66
SE Browns	1.20	0.66	1.01
Georges Bank	7.12	4.43	9.50

Spring catch rates in kilogram per trap haul (kg/th) of the five assessment areas.

Area	1994-1998	1998-1999	1999-2000
Crowell Basin	2.66	1.75	2.98
SW Browns	2.15	1.74	1.63
Georges Basin	2.23	1.09	1.74
SE Browns	2.11	1.78	1.73
Georges Bank	0.43	0.37	0.27

LFA 34 – 41: POPULATION ANALYSIS

Working Paper: Pezzack, D.S., C.F. Frail, P. Lawton, D.A. Robichaud, and M.B. Strong. Update on Stock Status of American Lobster, *Homarus americanus*, Lobster Fishing Area 34. RAP Working Paper 2001/28.

Rapporteur: C. Frail

Discussion

The Length Cohort Analysis (LCA) was used to calculate an overall exploitation rate for LFA 34. It was suggested that caution needs to be exercised when using the LCA in a non-equilibrium situation.

Many questions were raised about v-notching and how a rate of v-notching was determined. Should more v-notches have been observed in the sea samples considering the number of animals reported as notched? How does this effect the outputs of the Egg per Recruit (EPR) model? Is EPR a useful reference point? How was the reference point decided if the original EPR was not known?

Implementing a maximum size was discussed and it potential effects on the fishery. Would it effect different fishermen equally? The fishermen who fish in areas where the catch is made up of large lobsters may be forced to redistribute their effort to an area of smaller size catches.

The discussion of the various questions raised was cut short due to time constraints.

Recommendations

- LCA: Conduct LCA using only the data from 1997-2000 that falls within the corridor sampled in 1998/99.
- EPR: Recommend that the benefit of the Brown's Bank closed area be considered in determining EPR.
- Working group on v-notching.

LFA 35 – 38: FISHERY INDEPENDENT INFORMATION

Working paper: Lawton. P., D.A. Robichaud, R.W. Rangeley, and M.B. Strong. 2001. American Lobster, *Homarus americanus*, population characteristics in the lower Bay of Fundy (Lobster Fishing Areas 36 and 38) based on fishery independent sampling. RAP Working Paper 2001/17.

Rapporteur: D. Robichaud

Discussion

There were discussions on the level of diver-based sampling techniques that would be needed to establish a prerecruit abundance index. Questions were raised as to which diver-based technique would be a better predictors of pre-recruit abundance; the air-lift suction sampling which is used for sampling lobster settlement; or the belt transect sampling technique which can be used to sample lobsters 1 to 5 years before recruitment into the fishery. There was no consensus as to which direction future research using diver-based techniques should take.

The close season trapping survey off Grand Manan was deemed a very interesting source of information for comparison of CPUE with the fishery data from the State of Maine for the same time period. The data could also be used for gear efficiency and gear interaction.

The close season trapping, which was done by volunteer fishermen, was seen by fishermen as a way to educate science with what fishermen already know about lobsters in their fishing areas.

The industry felt that other factors like; fish dragging during spring migration of lobsters off Grand Manan; the effect of salmon aquaculture on lobster habitat; and larval survival when potentially exposed to pesticide used to kill lice on salmon, should be evaluated before any other conservation measures are introduced. There were also concerns about illegal fishing by American fishermen along the Canada-US border.

Fishers were irritated by the fact that the presentations of papers were behind schedule that meant that they had to stay an extra day or miss the presentations.

LFA 35 – 38: SPATIAL ANALYSIS

Working paper: Lawton. P., M.B. Strong, D.A. Robichaud, D.S. Pezzack, and C.F. Frail. 2001. Catch size distributions in Lobster Fishing Areas 35, 36, and 38 during the 1998/99 and 1999/2000 fishing seasons. RAP Working Paper 2001/16.

Rapporteur: D. Robichaud

Discussion

It was pointed out that the benefits of the minimum size increase would only be felt in 8 to 10 years.

LFA 36 fisher was concern that to much emphasis was put on the way that LFA 36 had implemented or phase in the minimum size increase during the last three years. By emphasizing on the increase in minimum size and ignoring other conservation effort like v-notching, made LFA 36 look bad compared to LFA s 35 and 38. Fisher from LFA 36 felt that v-notching was ignored in the analysis and was not supported as a conservation measure.

In general fishers agreed with the calculations and extrapolations of the number of lobsters landed in the Bay of Fundy during the 1998-99 and 1999-00 fishing seasons. However it was pointed out that no information on the number of trap haul is available and CPUE could not be compared to LFA 34.

It was suggested that some port sampling should be done to verify if many lobster below the new minimum legal size of 82.5 mm CL are landed. However, fishers said that they were very supportive of the minimum size increase, and that the number of sub-legals should be very low.

LFA 35 – 38: POPULATION ANALYSIS

Working paper: Lawton. P., D.A. Robichaud, M.B. Strong, D.S. Pezzack, and C.F. Frail. 2001. Update on Stock Status of American Lobster, *Homarus americanus*, in the Bay of Fundy (Lobster Fishing Areas 35, 36, and 38). RAP Working Paper 2001/15.

Rapporteur: D. Robichaud

Discussion

In general the data presented was well accepted and the reviewer felt that some of the data showed very good examples of the recruitment pulse that occurred in the Bay of Fundy. There were concerns that the size of female maturity could have been overestimated and should

probably be reviewed. There was no trend in the number of berried females per trap haul between seasons.

A length frequency model (T+1 or T-1) was suggested, in an effort to demonstrate the effect, if any, that the large increase of first molt group (81-94 mm CL) has had on the second molt group (95-109 mm CL). It was felt that there was no obvious increase in the number of lobsters in the second molt group even when there was a large increase in the number of lobsters in the first molt group the previous year.

The short-term outlook looks good. However a shift in the larger molt group has not been apparent.

The data should show the areas of the Bay of Fundy that have a recruitment base fishery and those that are largely base on migratory lobsters. In the 1980's the Upper Bay of Fundy was almost totally based on seasonal migration of lobsters and today is largely based on first year recruitment into the fishery.

The general feeling was that lobster landings data prior to 1995 (The year they changed from sale slips to mandatory monthly logbook reporting) were not very dependable. Also the landings reported by Statistical District (SD) does not document the movement of the number of licenses from SD in areas of lower production to SD in area of high abundance.

Sea sampling and index fishermen would be the best way to capture seasonal trends in the fishery.

LFA 31 – 33: GENERAL DISCUSSION

Rapporteur: Peter Lawton

In relation to the use of CFV landings data to explore associations among port clusters and port cluster groups there was some confusion among industry members on the intended use of the analyses. There was a concern that the analyses may be used to interpret stock levels or trends. Industry members commented on potential mis-reporting of landings that may vary between areas. In response it was reiterated that the analysis is primarily intended to look at linkages between small areas to assist in the interpretation of LFA and LPA structures, not to make statements on overall stock status. It was acknowledged that prior analysis of catch data along the Eastern Shore by DFO (S. Nolan report – Include reference?) indicates that catch data in some areas is particularly suspect, e.g. in proximity to Halifax.

Potential problems with the approach were noted, related to the influence of local-scale factors concerning fleet dynamics that may obscure relationships based solely on port landings by CFV. For a number of ports there are overlaps between fishing areas which may suggest alternative groupings to those derived in the present analysis. Additionally the movement of trapping locations to deeper water, which may vary annually, was suggested as a potentially important factor in determining annual landings for some ports.

The work on incorporating temperature effects into removal methods for estimating exploitation rates capitalized on data obtained as part of a broad-scale project sponsored by the Fishermen and Scientists Research Society (FSRS). The data set consisted of daily counts of sub-legal sized lobsters returned after trapping and legal sized lobsters removed each fishing day from standardized traps

Discussion related to the effects of trap type on catchability and temporal effects over the fishing season. Although the FSRS study used standardized traps it was suggested that the effect of trap type might be particularly important right at the start of the commercial season, with major effects occurring during the first week of the season. Although sublegals are not removed their catchability may change in relation to changes in catch rate of legals after depletion, as well as due to temperature effects.

Recommendations

- Work on small-scale associations of landings should be extended to include LFA 33/34 association and other LFA's within the Gulf of Maine area as one approach to delineating LPA structure.
- The work on landings analysis could be extended considerably with access to spatial reporting of landings and effort similar to the catch settlement reports used in the LFA 34 fishery
- Analysis of in-season trends in catch rates from special purpose traps deployed by industry in a standardized approach should be further investigated. There needs to be some attention paid to the longer-term objectives for this type of work in order to ensure that the appropriate experimental designs are developed for trap deployment (e.g. standard locations through season, or movement of trap locations across grounds.
- Analytical techniques used to explore captain effects in offshore LFA 41 fishery could be applied in this context – issues related to change in participation in studies over time.

LFA 34 – 41: GENERAL DISCUSSION

Rapporteur: Peter Lawton

This assessment cycle provided a major advance in analytical approaches due to the availability for the first time of comprehensive spatial reporting of catches and effort. A more refined estimate of the relative importance of the midshore fishery was presented as were a number of new analytical approaches to assessing egg production potential on an area by area basis. The new assessment framework provides the possibility for a range of additional analytical approaches to be explored.

The use of industry-supplied data on area catch rates, as well as information on v-notching activity provides a major increment in the incorporation of industry observations into the assessment.

Although there was general consensus that the assessment development path was a good one there were a number of uncertainties raised related to the current status of the data in relation to the projections on stock status:

1. The general sampling design based on sea sampling trips needs to be evaluated further with respect to use made of data. The approach in the assessment was to weight sampling in relation to landings (for expansion of landings to number caught at size). However, sea sampling was also used for interpretation of biological events and distribution of non-legal catch components (shorts, berried). A different sampling design may be required to optimize for these other program objectives.
2. Based on the current two-year data series some of new area-based relationships of size structures and relative egg production potential presented between areas (inshore, midshore, offshore) should be considered preliminary. Fishermen at the meeting suggested there would be a change in the relative importance of midshore landings in the 2000/01 fishing season (an increase) based on their information; also that there should be changes observed in the catch size structure. The degree to which these observations are identifiable in forthcoming data analyses will provide a good test of the sensitivity of the assessment data.
3. Related to the use of sea sampling data as the primary data source for analysis of catch size distribution it was noted that the analysis could have been based on port sampling, and an additional potential role for lobster buyers was identified.
4. Due to funding considerations the initial approach to expanding the at-sea sampling program used an inshore-offshore transect model. With introduction of the fleet-wide catch settlement reports a grid-based approach was developed. There is a need to evaluate the cost-effectiveness of the higher sampling rates in terms of longer-term program definition.

The approach used to estimate exploitation rates was length cohort analyses. Depletion estimators were not available, although there are some potential approaches to look at based on techniques such as those described by Claytor (this meeting).

There was considerable debate on the assumptions required of the LCA method related to the constant recruitment, and a closed population. Based on recommendations from the LFA 41 assessment (Kenchington, 2000), assessments of exploitation rate were generated for LFA 34, and for LFA 34 combined with data from 4X portion of LFA 41. Estimates generated were similar to those presented in the last LFA 34 assessment.

New approaches were presented to evaluate the removal levels of mature female lobsters, as well as estimated egg production potential removed by inshore, midshore, and 4X LFA 41 fleet sectors. The approach represented a new integration of data from the spatial landings reports, sea sampling, and E/R modeling. This new linkage of landings data to reproductive potential was endorsed by the reviewers.

Related to assessment of contributions of recently introduced measures (minimum size increase; v-notching) to conservation status (E/R) there was considerable debate on the current

interpretation of v-notching rate, both in terms of the estimates derived in the field, and the incorporation of v-notching in the E/R assessment.

There was a recommendation that additional attention be paid to the way in which the current E/R model accounts for variations in vulnerability of female lobsters through time (e.g. quarterly catchability rate). The low rate of encounter of v-notched lobsters in the available at sea sampling data was thought by some to provide a reasonable estimate of v-notching rate due to the large number of lobsters sampled; however, there are still a number of uncertainties on the use of the available data. As noted in the discussion on landings expansion, the sea sampling program was designed principally against area landings information, not specifically as a field program to assess v-notching rate.

In the working paper on LFA 34 reference was made to recent data from Maine and Rhode Island on a decline in lobster settlement strength in the late 1990's. Information from another research group working on lobster settlement that challenges this interpretation was not mentioned. It was recommended that the discussion on settlement trends should acknowledge the current debate on the regional significance of these data. The Bay of Fundy stock assessment presents information from a similar settlement monitoring program in LFA 36, and was considered the logical place for an extended discussion on this issue.

Current understanding of broad-scale environmental or ecological forcing of lobster landings was questioned in connection with the incorporation of statements on historical and current landings trends in other areas of the Atlantic zone and their potential to influence LFA 34. The synchrony of the widespread increase in landings in the Atlantic zone during the 1980's was noted along with recent downturns in landings in a number of regional fisheries (some of which were the first to show increases in the 1980's). The inference that this may preface a decline in the LFA 34 was challenged.

Consensus was that this discussion was appropriate to retain as a general management consideration. That is, recent declines in landings in other areas are useful as an example to LFA 34 managers and industry as to how quickly landings can change (perhaps requiring accommodation in the management system), but should not be included as an outlook for the fishery.

This was an update of a paper presented at the LFA 41 RAP (Kenchington 2000). Analyses of Fall catch rates at the last RAP showed a declining trend in the available time series, although recent industry data (not then available for analysis) indicated that catch rates had subsequently improved. The Fall analysis was updated and new analyses were conducted on Spring fisheries data.

The catch rate analysis approach was endorsed by the reviewers. However it was noted that in the present application (LFA 41) there is a very sparse matrix for evaluating captain effects. A number of other technical issues were identified in relation to spatial aspects of the data, as well as temporal factors (trends in residuals). Emphasis was placed on the need to retain a good degree of spatial resolution in any further analyses, as potential changes in the fishery

may occur at margins of distribution first. If the data were consolidated too much signals in the catch rate may be masked.

The observation was made that as the fishery is largely targeting a migratory stock variability in catch rates are possibly less due to captain effects than intrinsic biological factors.

It was decided not to update the existing LFA 41 stock status report, but to make this analysis available for management use.

Of major concern to fishermen representatives were statements in the SSR on the historical level of fishing activity in the midshore area prior to the expansion of effort by LFA 34 fishermen. Requests were made for a more definitive statement and supporting analysis/documentation for conclusions on the magnitude of prior effort (e.g. American effort prior to the Hague Line).

A need was identified for more generic presentation of landings data for the LFA's adjacent to LFA 34 in terms of identifying regional scale trends in landings

Changes in resource status over the long term (e.g. back to the initial 50 yr. of fishery) are based on very few documented sources of data on size distribution of catch. There was a recommendation to focus discussion on changes in resource status to trends from middle of last century

Interpretation of the current size structure of the landed catch as representing a recruitment based fishery (with proposed management change reducing that reliance) was addressed by fishermen representatives. The point was made that at any minimum size the fishery will largely be based on recruitment into the first legal molt group. There is clearly a need for a better definition of terminology used for defining catch size structure which makes clearer the linkage between size at entry into the fishery and size at maturity. Some of the analyses presented in the stock assessment on proportion of animals in the catch by various reproductive categories provide the basis for development of more precise terminology.

Exploitation rates derived by LCA approaches need to be better defined in relation to the assumptions of the methodology. The basis for continuing to produce new estimates for LFA 34 in recent years, vs. the decision in the Bay of Fundy LFA's not to produce new estimates needs to be highlighted. Rationale for the linkage of LFA 34 with the 4X portion of LFA 41 for generation of exploitation rate estimates needs to be improved.

While there was clear endorsement of the new approaches to evaluating removal of potential egg production by sectors of the fleet in terms of evaluating conservation approaches, there was a need for further work to derive appropriate definitions for different biological categories of female lobsters.

In relation to management considerations, there was considerable uncertainty on the appropriate value of v-notching to include in E/R assessments based on the current data availability. It was felt that there needs to be additional work done by Industry and Science to

develop appropriate monitoring approaches and agreements on values to attribute to v-notching in general conservation planning.

As the statements on expansion of effort in the midshore relate to concerns on the removal of refugia in the Gulf of Maine system it was felt that there needs to be a broader scale evaluation of refugia, with a primary consideration being placed on the Browns Bank Closed Area.

Recommendations

- Spatial reporting of catches through fleet-wide catch settlement reports provided a major increase in spatial data on the LFA 34 fishery, but the reliance on paper-based reporting generates a significant overhead for data management. The approaches could be readily adapted to the use of new electronic data logging approaches, such as those now being explored in the Maine lobster fishery.

LFA 35-38: GENERAL DISCUSSION

Rapporteur: D. Robichaud

Because of the shortage of time most of the comments were directed at changes in the SSR and were noted by P. Lawton.

An LFA 36 fisher gave a short presentation to the group, which will be added to the proceedings. Some fishers felt that there was a lot of inconsistency in the past as to the way Science analyzed and interpreted fisheries data. They felt that sometime the method of analysis used were not consistent and reflected more management objectives than what the data really showed.

In general industry think that the collection of fishery independent data is good. They want to participate more in the collections of fishery independent data and are willing to commit more time and effort.

COMMENTS OF EXTERNAL REVIEWERS

The reviewers considered their observations under the following headings – fine scale spatial analysis of the fishery, database development, indices of stock status, experimentation and modeling.

Fine-scale Spatial Analysis of the Fishery

The DFO lobster science team was encouraged to continue and expand its linkages with the fishing industry. Also, it was recommended that a survey of current fishing practices be undertaken. This would document the number of traps, soak times, seasonal patterns, the

demographics of the fleet and the fishermen. The collection of positional information was encouraged, perhaps through black boxes, as was enhanced sampling and other experimental data.

Database Development

There was a recommendation for infrastructure investment for high volume, geo-referenced, real-time data to be stored in relational databases. These data should retain as high a resolution as possible. Also, links to other data collection programs were encouraged. Both active and passive data acquisition system on vessels were recommended, as was new computers for the assessment scientists.

Indices of Stock Status

It was recommended that time series of indicators of the abundance by size group and area be developed. The biological attributes of the landings, e.g. sex, maturity, V-notching, shell hardness, etc. be developed. Also, there is a need for fishery dependent indices of recruitment.

These indices should be used to develop population models which explicitly examine interrelationships in the data. For instance, the abundance indices could be linked to the catch i.e.

Catch (t+1)	vs	Pre-Recruit Index (t)
Group I in year t+1	vs	Group I-1 in year t

Examples of potential relationships (based on Gulf of Maine lobster) were presented (figures 1 and 2). Other potential analyses include creation of bubble plots of abundance, catch, effort, etc, by region versus year, examination of linkages to environmental information, examination of spatial/temporal variations in fishing activity and landings, linkage of sea sampling design to synoptic fishing patterns and analysis of linkages across the fisheries in the various LFAs.

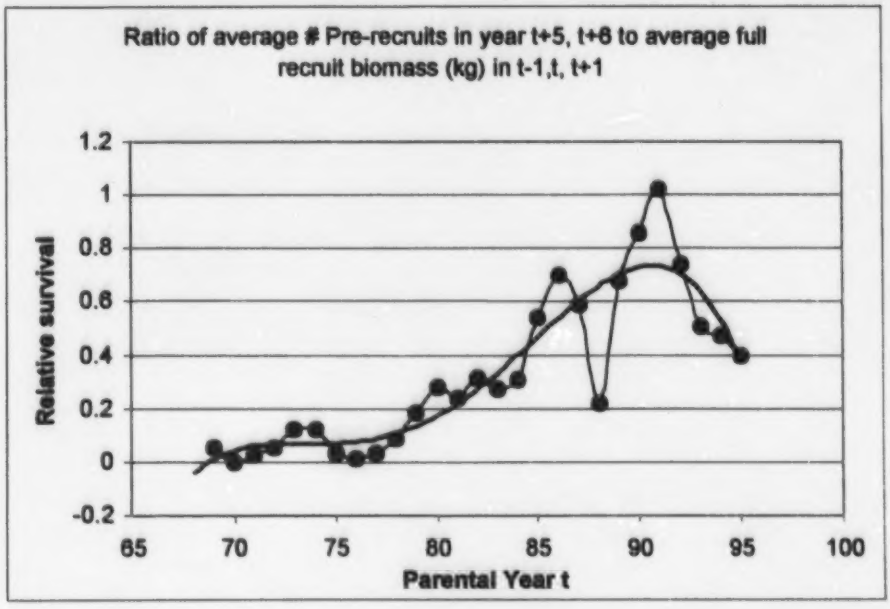


Figure 1. Relative Survival Rate derived from NMFS Gulf of Maine Fall Research Vessel Survey abundance indicators

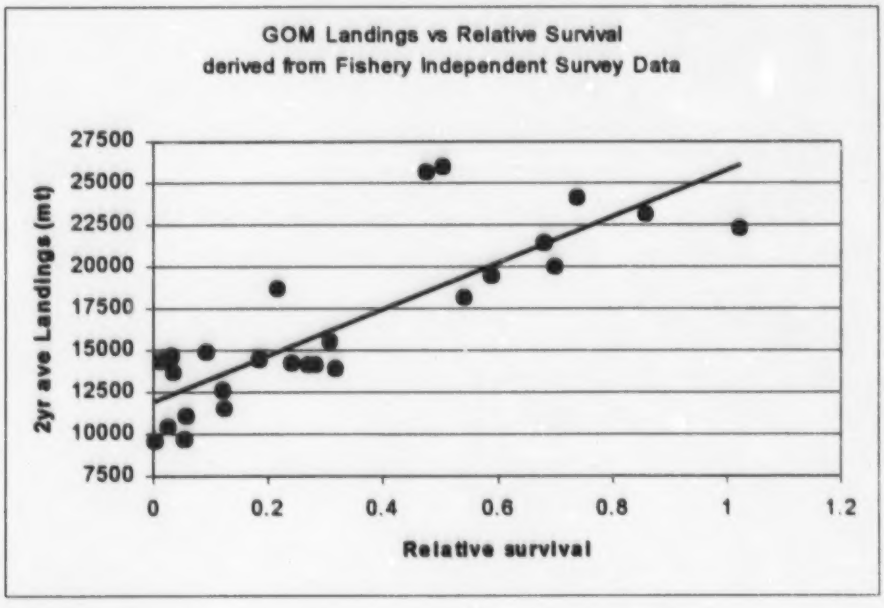


Figure 2. Relationship between landings and Relative Survival Rates derived from NMFS Gulf of Maine Fall Research Vessel Surveys

Experimentation

The reviewers recommended the conduct of large-scale experiments. This included the development of independent measures of abundance (trawl, divers, ROV, ventless traps), tagging studies, growth experiments, closure studies, and trap selectivity by size group.

Modeling Improvements

A number of improvements to the E/R model were suggested. The effects of trends in recruitment on LCA estimates of fishing mortality requires examination. The link between within-season estimate of abundance/exploitation and environmental factors also needs to be examined. Partial recruitment functions need to be incorporated into the E/R model. The model should focus on E/R predictions rather than on fishing mortality reference points e.g. F 10%.

Overall, there is a need for improved length-based modeling and the use of spatial models of the resource and the fleets as a conceptual basis for management policy development.

Management Planning Recommendations

The reviewers also provided comments on management plan issues. Given the high state of current abundance, they recommended that managers plan for possible declines in catch now. The issue of decline itself requires definition – what constitutes a crisis? There is a need for planned responses to avoid panic reactions.

They recommended meaningful dialogue between managers, scientists and fishermen, as well as between managers of Canada and the USA.

Overall, there is a need to create an environment conducive to experimentation so that the effects of closed areas can be studied, optimal trap designs investigated and specialized experiments e.g. V-notching, growth studies, etc. undertaken.

Appendix 1. List of Participants

Participant	Affiliation/Address	Telephone	Fax	E-Mail
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Raul Rago	NMFS, Woods Hole, USA	(508) 495-2341	(508) 495-2393	Paul.rago@noaa.gov
Alan Reeves	IFD/DFO, Dartmouth, N.S.	(902) 426-4999	(902) 426-1862	Reevesa@mar.dfo-mpo.gc.ca
David Robichaud	IDF/DFO, St. Andrews, N.B.	(506) 529-8854	(506) 529-5862	Robichaudd@mar.dfo-mpo.gc.ca
Ashton Spinney	LFA 34	(902) 643-2490	(902) 643-2654	
L. Wayne Spinney	LFA 34, V/P WNFC	(902) 645-2564	(902) 645-3456	Melanjo@klis.com
Stephen Smith	IFD/DFO, Dartmouth, N.S.	(902) 426-3317	(903) 426-1862	Smithsj@mar.dfo-mpo.gc.ca

Participant	Affiliation/Address	Telephone	Fax	E-Mail
Klaus Sonnenberg	GMFA	(506) 662-8481		Gmfa@nb.aibn.com
Tim Surette	Fish. Manag./DFO, Yarmouth, N.S.	(902) 742-0871	(902) 742-6843	Surettet@mar.dfo-mpo.gc.ca
John Tremblay	IDF/DFO, Dartmouth, N.S.	(902) 426-3986	(902) 426-1862	Tremblayj@mar.dfo-mpo.gc.ca
Tim Willis	IFD/DFO, Dartmouth, N.S.	(902) 426-7444	(902) 426-1862	Willist@mar.dfo-mpo.gc.ca
Carl Wilson	Dept. Marine Resources, Maine, USA	(207) 633-9538	(207) 633-9579	Carl.wilson@state.me.us

Appendix 2. Letter of Invitation

Maritimes Regional Advisory Process
Bedford Institute of Oceanography, P.O. Box 1006
Dartmouth, Nova Scotia, B2Y 4A2
Tel. (902) 426-3526 / Fax. (902) 426-5435
e-mail: oboyler@mar.dfo-mpo.gc.ca

21 March 2001

Distribution

Subject: **Peer review of LFA 33-41 Lobster Stocks**

The assessments of lobster stocks in Maritimes Region will be reviewed in the Conference Room, Mic Mac Amateur Club, located at 192 Prince Albert Road, Dartmouth, N.S. during 2-5 April 2001.

The objectives of peer review are: to examine the scientific approaches of the stock assessments; to identify any weaknesses in methodology; to help improve the clarity of assessments; to identify important questions that may have been neglected; and to make research recommendations. The meeting's terms of reference and draft agenda are attached.

The peer review includes detailed review of stock assessments and Stock Status Reports. Stock assessments will be done for Lobster Fishing Areas 33-41. Copies of the draft assessments and the draft stock status reports will be sent to the referees one week before the meeting to allow them time to become familiar with the material. At the meeting, science staff will provide a brief overview of their assessments which should include: the main conclusions, the supporting evidence, any new methods, and major limitations. The presentation will be followed by comments from any of the scientific referees and then from any of the participants. Finalised stock status reports will be prepared at the meeting. The minutes of this meeting will be published as a proceedings.

I invite you to send a member of your organization to this meeting. As this is a scientific meeting to review the technical basis of the assessment, this individual should be knowledgeable in your area's fishery and thus be able to contribute to the discussion.

Could you please let me know at your earliest convenience the name of the individual who will be attending (902 426-7070 or myrav@mar.dfo-mpo.gc.ca).

We greatly appreciate your contribution to this valuable exercise.

R.N. O'Boyle

cc: M. Sinclair

Distribution

Chair

R. O'Boyle

Assessment Team

Peter Lawton
Doug Pezzack
Ross Claytor
Stephen Smith

External Reviewers

Carl Wilson (US)
Paul Rago (US)
Marc Lanteigne

DFO Science

John Tremblay
Cheryl Frail
Robert Miller
René Lavoie

DFO Management

Mike Eagles
Jim Jamieson
Tim Surette
Ian Marshall
John Moores

Non-DFO Government

Bruce Osborne (NS)
Ron Cronk (NB)
David Flint (Dalhousie University)

Industry

LFA 33

Wayne Eddy
Ernie Pierce

LFA 34

Ashton Spinney

LFA 35

Kevin Hurley

LFA 36

Andy Gallant

LFA 38

Klaus Sonnenberg

LFA 41

Eric Roe
Louise Goodwin

Appendix 3. Meeting Remit

In support of fisheries management decisions and development of conservation plans in the Eastern Gulf of Maine-Bay of Fundy lobster resources, the following issues will be evaluated:

The Fishery

- What are the historical spatial and temporal trends in landings, effort, catch rates and size composition?

Resource Status

- What are the historical trends in the abundance, reproductive potential, recruitment and exploitation of the resource?
- To the extent that historical trajectories of the various indicators of stock status differ, what considerations affect the interpretation of each attribute as a reliable indicator of stock status?
- How do the stock indicators compare to existing egg per recruit reference points and to that at the beginning of the management plan?
- How do the stock indicators compare to other potential reference points?

Management Considerations

- What suite of indicators and reference points can be used to guide the future management of this resource?
- What have been the consequences of the new conservation measures relative to the objective of achieving a doubling of eggs per recruit, using the following two areas as examples:
  - Minimum size increase in LFA 38 during 1998-2000
  - V-notching in LFA 34 during 1998-2000
- Biological assessment and conservation management on an LFA by LFA basis represents one approach to evaluation of lobster resource status. However, biological linkages within this group of LFA's do not map conveniently onto the existing management structure. What are the implications associated with using different areas for biological assessment purposes, and conservation management?

Outlook

- What is the short-term (1 –2 years) and longer-term (3 – 5 years) outlook for the fisheries?

- What is the short-term and longer-term expectation of the stock relative to the objective of doubling eggs per recruit?

- What additional conservation measures, if any, would ensure sustainable harvests from the Eastern Gulf of Maine-Bay of Fundy lobster resources?

Appendix 4. Meeting Agenda

Monday April 2

13:00-13:30	Introduction and Remit / R. O'Boyle
13:30-14:00	Zonal Context (Landings trends for Canada & US, FRCC conservation plan, etc) / D. Pezzack
14:00-14:30	Report of LPA Workshop / R. Claytor
14:30-15:00	LFA 33: Stock Structure
15:00-15:15	Break
15:15-15:45	LFA 31-33: Quality of lobster fishing effort data (late 1990s vs early 1980s) / R. Miller & R. Duggan
15:45-16:30	Interaction of catch rates and temperature (FSRS data analysis) / R. Claytor
16:30-17:30	Discussion

Tuesday April 3

09:00-09:45	LFA 34 & 41: Spatial analysis (analyses of new catch settlement reports and enhanced fishery sampling for 1998/1999 and 1999/2000) / D. Pezzack
09:45-10:15	LFA 41: Catch rate analysis / R. Claytor
10:15-10:30	Break
10:30-11:15	LFA 34 & 41: Landings, Sampling, Population Analyses / D. Pezzack
11:15-12:00	LFA 34 – 41: Discussion
12:00-13:00	Lunch
13:00-13:30	LFA 35 - 38: Fishery independent information / P. Lawton
13:30-14:15	LFA 35 - 38: Spatial analysis / P. Lawton
14:15-15:15	LFA 35 - 38: Landings, Sampling, Population Analysis / P. Lawton
15:15-15:30	Break
15:30-17:00	LFA 35-38: Discussion

Wednesday April 4

09:00-10:15	Re-analyses
10:15-10:30	Break
10:30-12:00	LFA 34 & 41 SSRs: Discussion
12:00-13:00	Lunch
13:00-15:00	LFA 35 – 38 SSR: Discussion
15:00-15:15	Break
15:15-17:00	Overview: Discussion

Thursday April 5

09:00-12:00	Review of SSRs, research recommendations and proceedings drafts.

Appendix 5. List of Documents Tabled

Claytor, R. 2001. Adjusting Lobster CPUE Trends for Temperature Effects. RAP Working Paper 2001/36.

Claytor, R., S. Nolan, and R. Duggan. 2001. Associations among LFA 33 Lobster Fisheries. RAP Working Paper 2001/31.

Claytor, R., D. Pezzack, C. Frail, and K. Drinkwater. 2001. Analysis of LFA 41 Lobster Catch Rates 1985 – 2000. RAP Working Paper 2001/30.

Duggan, R.E. 2001. Lobster Fishing Effort on the Outer Coast of Nova Scotia: 1983 versus 1998. RAP Working Paper 2001/29.

Lawton, P., D.A. Robichaud, R.W. Rangeley, and M.B. Strong. 2001. American Lobster, *Homarus americanus*, population characteristics in the lower Bay of Fundy (Lobster Fishing Areas 36 and 38) based on fishery independent sampling. RAP Working Paper 2001/17.

Lawton, P., M.B. Strong, D.A. Robichaud, D.S. Pezzack, and C.F. Frail. 2001. Catch size distributions in Lobster Fishing Areas 35, 36, and 38 during the 1998/99 and 1999/2000 fishing seasons. RAP Working Paper 2001/16.

Lawton, P., D.A. Robichaud, M.B. Strong, D.S. Pezzack, and C.F. Frail. 2001. Update on Stock Status of American Lobster, Homarus americanus, in the Bay of Fundy (Lobster Fishing Areas 35, 36, and 38). RAP Working Paper 2001/15.

Pezzack, D.S. 2001. American Effort in LFA 34 prior to ICJ decision. RAP Working Paper 2001/56.

Pezzack, D.S., C.F. Frail, P. Lawton, D.A. Robichaud, and M.B. Strong. 2001. Update on Stock Status of American Lobster, Homarus americanus, Lobster Fishing Areas 34. RAP Working Paper 2001/28.

Pezzack, D.S., C.F. Frail, P. Lawton, M.B. Strong, D.A. Robichaud, and P. Carroll. 2001. Spatial Patterns in landings, effort, and moth groups in Lobster Fishing Areas 34 and 41 during the 1998/99 and 1999/2000 fishing seasons. RAP Working Paper 2001/27.

Appendix 6. Research Recommendations

Report of Zonal LPA Workshop

- Conduct a zonal assessment meeting in the summer 2002 to review:
  - Status of four-year plan
  - LPA criteria
  - Spatial management model
- Support a project to develop a spatial management model

LFA 33: Stock Structure

- A research recommendation suggested during this meeting would be to compare the results of the analysisfrom the western portion(s) of LFA 33 to that of LFA 34.

Interaction of Catch Rates and Temperature

- The analysis should be extended to the whole fishing season and especially to the last two weeks of the season in the spring when temperatures are increasing.
- The analysis assumed that the critical temperature when lobsters became active was the same for all size groups. Observations from fishermen indicated that this was probably not correct and more work needs to be done on defining this temperature for the size groups in the study. The study had also included all sizes of sublegals and the suggestion was made that the analysis be restricted a smaller size range close to the upper limit of this size class.
- The method assumes that the population in the area is closed to immigration, emigration and mortality during the period analysed. Further the method assumes that declines in the catch rate by the fishery are the same as measured by the cumulative catch in the traps dedicated to the FSRS recruitment index which are fished in a fix location. The robustness of the method to violations of these assumptions needs to be evaluated.
- There is a possibility that due to interactions between sublegal and legal sized lobsters the catchability of the former size group would increase as the latter size group are depleted. The effects of this potential interaction on the analysis needs to be evaluated.

LFA 34 and 41: Spatial Analysis

- Survey within the Brown's Bank closed area.
- CPUE calculation for the entire LFA 34 shown as a centre of concentration and the decrease as a radiation from the centre.

- New columns in logbook: number of berried females caught and number of v-notches caught.

- ANOVA on logbook data with area/depth/time etc. showing interactions controlling catch rates and possibly suggesting how to group the grids.

LFA 41: Catch Rate Analysis

- No recommendations.

LFA 34-41: Population Analysis

- LCA: Conduct LCA using only the data from 1997-2000 that falls within the corridor sampled in 1998/99.

- EPR: Recommend that the benefit of the Brown's Bank closed area be considered in determining EPR.

- Working group on v-notching.

LFA 35-38: Fishery Independent Information

- No recommendations.

LFA 35-38: Spatial Analysis

- No recommendations.

LFA 35-38: Population Analysis

- No recommendations.

LFA 31-33: General Discussion

- Work on small-scale associations of landings should be extended to include LFA 33/34 association and other LFA's within the Gulf of Maine area as one approach to delineating LPA structure.

- The work on landings analysis could be extended considerably with access to spatial reporting of landings and effort similar to the catch settlement reports used in the LFA 34 fishery.

- Analysis of in-season trends in catch rates from special purpose traps deployed by industry in a standardized approach should be further investigated. There needs to be some attention paid to the longer-term objectives for this type of work in order to ensure that the

appropriate experimental designs are developed for trap deployment (e.g. standard locations through season, or movement of trap locations across grounds.

- Analytical techniques used to explore captain effects in offshore LFA 41 fishery could be applied in this context – issues related to change in participation in studies over time.

LFA 34-41: General Discussion

- Spatial reporting of catches through fleet-wide catch settlement reports provided a major increase in spatial data on the LFA 34 fishery, but the reliance on paper-based reporting generates a significant overhead for data management. The approaches could be readily adapted to the use of new electronic data logging approaches, such as those now being explored in the Maine lobster fishery.

Appendix 7. Industry Consultations in preparation for RAP

LFA 33 lobster workshop, Sambro N.S.
October 10, 2000.

Attendees:

Industry:		DFO:	Ross Claytor
Raymond Naugle	E. Passage		Stephen Nolan
Wayne Eddy	E. Passage		Ron Duggan
James Gray	Sambro		
David Gray	Sambro	FSRS:	Carl MacDonald
Patrick Gray	Sambro		
Victor Gray	Sambro		
Lionel Young	Terence Bay		

Following a round table introduction, fishers were asked to give an individual perspective of the fishery in their respective areas.

Fishers from Sambro and Dover felt that lobster stocks are in good shape for the following reasons,

a) Effort has been increasing for the past few years but individual landings are still increasing by a small amount each year.
b) The area fished has increased slightly by moving further offshore but lobsters aren't found in deeper water as in ports further west. Maximum depth fished is 25 fathoms.
c) More fishers are fishing more traps and more days in spring than in the past when groundfish were more plentiful.
d) More kelp and fewer urchins on bottom than in 1980's.
e) Absence of groundfish lessens predation on small lobsters.

Fishers from Eastern Passage thought landings were holding steady for last 5 years but are shared among more licenses than in the past. They agreed that more effort is expended in spring than in 1980's. The fishery takes place in 5-25 fathoms and grounds have expanded only slightly. Lobsters didn't move to shallower nearshore water as usual last spring.

Individual observations put forth in support of stable lobster stocks included:

a) The silver hake fishery depleted hake stocks that provided spawn for deep-water lobsters to feed on. Since the fishery ended, hake is more abundant and lobsters are more plentiful.
b) The number of draggers has declined to about one tenth of the 700 that operated at one time. The trawl design has changed and is less harmful to the bottom, which allows for better lobster habitat.

Areas of joint and individual concern for future of the lobster fishery were also advanced.

a) The seal population is still growing and fishers are concerned about increased lobster predation.
b) Warm water in early part of 1998 and 1999 spring fishery resulted in unusual amount of large females being landed and we should be concerned about recruitment in 7-8 years.

Carl MacDonald gave a brief presentation on the FSRS recruitment study. To date, data analysis for the spring portion of the 1999 season has been completed.

Recent and historical CPUE data from voluntary logs and length frequency data from port sampling were presented by R. Claytor. Fishers requested that from now on data be presented in inches and pounds as still used by buyers and shippers. The consensus was that voluntary logbook data provides an accurate description of the CPUE trends in the fishery. Steve Nolan explained that port sampling data, (length frequencies), are collected at a consistent time of year from unsorted catches and from a number of boats from each port. Given these sampling conditions it was agreed that the length frequencies presented were consistent with observations of those fishing in the area. He also noted that there was a scarcity of logkeepers from the eastern end of LFA 33 and made an appeal for those present to consider keeping individual logs. Two attendees said they would try to get some of their colleagues to keep logs. The current system used by statistics branch for calculating annual landings from mandatory logs was thought to be inefficient and probably underestimates total landings by about 10-15%. The underestimation is consistent from year to year.

Ross Claytor outlined a project designed to learn more about lobster abundance by conducting short term tag, release, and recovery. A discussion followed about the timing of such a project and why it could not be conducted during the fall fishery. The explanation that utilization of time and resources would be more efficient and provide more and better data during a short term concentrated project was accepted. It was indicated that this project would not serve as a trade off for future conservation measures. Fishers expressed concern about poaching of traps during a pre-season project. Fishers from port clusters 2 and 3 agreed to participate depending on the outcome of cost sharing arrangements. Fishers were in favour of research activities conducted on a more local basis because they feel conditions differ from port to port and recommended that at least two sites be tested. A follow up meeting will be held to finalize details.

LFA 33 lobster workshop, Sambro, N.S.
February 20, 2001.

Name	Location
Victor Gray	Sambro
James M. Gray	Sambro
Stephen Gray	Ketch Harbour
John Sihru	Cow Bay
Tom Henneberry	Eastern Passage
Patrick Gray	Sambro Harbour
Gerald Mason	NSAF
Jeff Graves	FSRS
Vincent Boutilier	Port Cluster 4B
Eugene D Young	Hubbards
Lionel Young	Hubbards
Bill Bell	Hubbards
Kevin Duffy	Terence Bay

Ross Claytor presented an outline of data and preliminary analytical results that would be used to examine associations among fisheries in port clusters 1-13 in LFA 33, catch rates in LFA 41, and the effect of temperature on lobster trap catch rates using the FSRS recruitment trap data.

The presentation on the associations among port clusters began with a description of the number of boats and catch per boat by fall and spring portions of the season in each port cluster. Correlations among the port clusters for catches indicated that port clusters 1-5 and 8-13 formed two groups of associated port clusters with 6 and 7 being intermediate. The only port clusters where fall landings and spring landings were associated were port clusters 6 and 7. Port clusters were grouped into 1-4, 5-9, and 10-13 for catch rate analysis based on voluntary logbook reports for the fall portion of the season. Catch rates in each of these three areas increased appreciably during the fall season in each of the groups. All three groups were correlated for fall season for the years of common data collection.

Analysis of LFA 41 catch rates indicated an increase in catch rates in the most recent year compared to last year's analysis. In general Crowell Basin was distinct from Georges Bank in terms of landing and catch rate trends in LFA 41. The other areas were intermediate. An initial look at temperature was inconclusive and more work is required.

The FSRS data indicated that in general for the fall portion of the season temperature influences catch rate and that it might make up to a 5% difference in exploitation rate on average for all areas. Additional work is required to determine the reasons for differences among areas and the uncertainty involved in these estimates. The FSRS data looks very promising as a method for sorting out the relationship between temperature and catch rates.

Industry comments

- In port cluster 2 there were about 8 too many, and there are about 3 B Licenses.
- 1999 seemed ok
- In port cluster 1 there are about 17 licenses now.
- Port cluster 3 is ok, about 70 licenses
- Port cluster 4 was not sure.
- Port cluster 3 fall and spring should be about equal
- In port cluster 2 it should be equal in last two years, but there may be about a 5 boat difference
- In port cluster 1 there are less in spring than fall
- Water warms up more quickly in Shelburne and Liverpool at about two weeks before St. Margaret's Bay
- Timing of spring is important for landings
- In port cluster 1 more fishing was at 20-30 fathoms
- Urchin die off in 1996-97
- For 2000 port cluster 4 predicts lower catch rates because of sea urchins
- Sea urchins take over bottom
- A type of green moss is a problem
- Green crab are becoming a concern
- Size increase and V-notching too much change too quickly
- Difficult to sell larger lobsters to buyers
- Remember that 133-134 licenses are set to retire in LFA 33, B Licenses and part time
- In port cluster 1 off shore when season started
- Freshwater table in deep water
- In port cluster 4A, St. Margarets Bay, not many in 8-10 fathoms, most 5-6 fathoms
- In 4B Indian Pt. About 30% down from last year, same for Mahone Bay

LFA 33 lobster workshop, Bridgewater N.S.
October 3, 2000.

Attendees:

Industry:		DFO:	Ross Claytor
Myles Bush	West Dublin		Stephen Nolan
Gary Tanner	Bayport		Ron Duggan
Keith Bush	West Dublin		
Jaan Kariler	Rose Bay	FSRS	Kory Jollimore
Dale Cook	First South		
Austin Green	Lunenburg		
Barry Levy	Bridgewater		
Junior Risser	Riverport		
Michael Lunn	Hunts Point		
Stephen Scobey	Liverpool		

Following a round table introduction, fishers were asked to give an individual perspective of the fishery in their respective areas. From this there appeared to be general consensus on several points.

a) Landings are high compared to those in the late 70s and early 80s and there is no real concern for future of fishery given current regulations.
b) Except for one fisher, landings have increased or at least remained stable for the past 4-5 years.
c) Fishers have been expanding area fished by moving gear to deeper water since mid 1980's. i.e. from 15 fathoms to as much as 40 fathoms in some areas.
d) Larger run of lobsters from deeper water at first but average size has since decreased.
e) Water temperatures are higher than 1980's. Non native fish thought to have come from southern waters were observed .
f) Lobster movement to deeper water in fall and back onshore spring-summer.

Some individual observations were also put forth:

c) Landings are the same but have to work harder and fish more ground to maintain.
d) Deeper water lobsters are not on hard bottom.
e) Fishing large lobsters from an area makes more ground available for smaller lobsters.
f) Absence of groundfish inshore allows more small lobsters to survive.
g) Seals are major predators on lobster.
h) Appears to be a concentration of berried females on a 24-30 fathom ridge in fall

Kory Jollimore gave a brief presentation on the FSRS recruitment study. (See attachment) To date, data analysis for the spring portion of the 1999 season has been completed.

Recent and historical CPUE data from voluntary logs and length frequency data from port sampling, were presented by R. Claytor. The consensus was that voluntary logbook data provides an accurate description of the CPUE trends in the fishery. It was explained that port sampling data are collected at a consistent time of year from unsorted catches and from a number of boats from each port. Given these sampling conditions it was agreed that the length frequencies presented were consistent with observations of those fishing in the area. The current system for calculating annual landings from mandatory logs was thought to be inefficient and to underestimate total landings. The underestimation is consistent from year to year. The current system does not produce timely reports on landings.

Ross Claytor outlined a project designed to learn more about lobster abundance by conducting short term tag, release, and recovery. Fishers were in favour of research activities conducted on a more local basis because they feel conditions differ from port to port. It was agreed that the best geographic location for these projects would be one bay or fishing area that would represent port clusters 5-7 combined and one bay or fishing area that would represent port clusters 8-9 combined. A number of attendees volunteered to assist by providing manpower and vessel time. It was agreed that late summer - early fall would be the best time to conduct tests. A follow up meeting will be called to finalize details.

LFA 33 lobster workshop, Bridgewater N.S.
February 18, 2001.

Name	Location
Robert Swim	Port Mouton
Jack Dunlop	Port Cluster 9
Rick Clottenburg	Hunt's Point
Winfred Risser	Riverport
Barry Levy	Bridgewater/ Lunenburg
Jim Jamieson	DFO
Bradford Crouse	Liverpool East
Stephen Scobey	Mersey Point
Moyle L. Tumblin	La Have
Ross Claytor	DFO

Ross Claytor presented an outline of data and preliminary analytical results that would be used to examine associations among fisheries in port clusters 1-13 in LFA 33, catch rates in LFA 41, and the effect of temperature on lobster trap catch rates using the FSRS recruitment trap data.

The presentation on the associations among port clusters began with a description of the number of boats and catch per boat by fall and spring portions of the season in each port cluster. Correlations among the port clusters for catches indicated that port clusters 1-5 and 8-13 formed two groups of associated port clusters with 6 and 7 being intermediate. The only port clusters where fall landings and spring landings were associated were port clusters 6 and 7. Port clusters were grouped into 1-4, 5-9, and 10-13 for catch rate analysis based on voluntary logbook reports for the fall portion of the season. Catch rates in each of these three areas increased appreciably during the fall season in each of the groups. All three groups were correlated for fall season for the years of common data collection.

Analysis of LFA 41 catch rates indicated an increase in catch rates in the most recent year compared to last years analysis. In general Crowell Basin was distinct from Georges Bank in terms of landing and catch rate trends in LFA 41. The other areas were intermediate. An initial look at temperature was inconclusive and more work is required.

The FSRS data indicated that in general for the fall portion of the season temperature influences catch rate and that it might make up to a 5% difference in exploitation rate on average for all areas. Additional work is required to determine the reasons for differences among areas and the uncertainty involved in these estimates. The FSRS data looks very promising as a method for sorting out the relationship between temperature and catch rates.

Industry comments:

- The number of boats fishing in spring 1998-1999 was too low.
- The split between port clusters 1-6 and 7-13 was reasonable

- B licenses should be split out from the number of boats. There is one in port cluster 9, and other areas have about 1-4.
- The catches in the logbooks could be used to check correlations among areas if individual fishermen are consistent among years and between areas, but could be used to check on fall to spring correlations.
- Depth is a likely important factor in affecting cpue.
- During the late 1980s there was an increase in berried females.
- Localized native fisheries are important.

LFA 33 lobster workshop, Jordan Bay, N.S.
October 19, 2000.

Attendees:

Industry:		DFO:	Ross Claytor
David Nickerson	RR3 Shelburne		Stephen Nolan
Fred Perry	Port Saxon		Ron Duggan
Cecil Williams	Sable River		
Gordon Atwood	Barrington	FSRS:	Kory Jollimore
William Acker	RR2 Shelburne		
Robert Lloyd	Osborne Hbr.		
Wade Hemeon	RR2 Shelburne		
Shane Blenkhorn	RR2 Shelburne		
Ernie Pierce	RR2 Shelburne		
John Acker	RR2 Shelburne		
Robert Hopkins	RR2 Shelburne		
Alex Bower	Jordan Bay		
Wilford Smith	Port Latour		
Ricky Hallet	Lockeport		

Following a round table introduction, fishers were asked to give an individual perspective of the fishery in their respective areas.

Fishers from port cluster 10 felt that lobster stocks are still holding up because although there are more boats in the area now and many are fishing more days per season, landings have been steady with minor fluctuations for the last 5 years. The fishery in this area extends to about 20 fathoms. Concern was expressed as to what effect a salmon farm might have on absence of lobsters in an area where they were previously found.

Port cluster 11 fishers reported slight increases in landings over last 5 years. Several indicated that they are fishing "longer and harder'. The area fished has been moving further from shore each year and in some cases individuals are out to 30 fathoms and feel that they will have to move out more in the next few years. One comment indicated that the last 5 years were the best of the last 15.

Port cluster 12 reported that although they have been moving to deeper water over the last 5 years, they are maintaining good landings by working harder. The main body of lobsters appears to concentrate further offshore than in past. There are more lobsters on more open bottom and the reason for this is thought to be the absence of predators due to downturn in groundfish. Fishery extends to 25 fathoms.

Port cluster 13: The one representative from this area said that fishers had moved off to deeper water as much as 15-20 years ago and some are now at 40 fathoms. Landings per boat are holding steady but number of boats has increased from 15 to 70. Also, several boats now fish throughout entire 6 months of season. There are more small, (3"- 4" overall length) and more

lobsters on all types of bottom where they couldn't catch any 5-6 years ago. They feel that this is due to a combination of warmer water and fewer predators.

One interesting idea shared by several fishers from different areas was that if an attempt is made to fish on bottom where there are very few lobsters, there will be lobsters in that area in the following year. It appears that lobsters will move to the area if it is "baited". It was generally agreed that there is a larger run of lobsters from deeper water and that spring run of lobsters is larger than in the fall. Large "fantail" female lobsters are caught later in the spring in shallow water.

Kory Jollimore gave a brief presentation on the FSRS recruitment study. To date, data analysis for the spring portion of the 1999 season has been completed which shows varying numbers of pre recruit lobsters are caught for different LFA's.

Recent and historical CPUE data from voluntary logs and length frequency data from port sampling were presented by R. Claytor. After some discussion on the validity of data from individual voluntary logs a consensus was reached that voluntary logbook data provides an accurate description of the CPUE trends in the fishery. Steve Nolan explained that port sampling data, (length frequencies), are collected at a consistent time of year from unsorted catches and from a number of boats from each port. Given these sampling conditions it was agreed that the length frequencies presented were consistent with observations of those fishing in the area. He also noted that there was a scarcity of logkeepers from the some areas of LFA 33 and made an appeal for those present to consider keeping individual logs. Fishers requested that from now on data is presented in inches and pounds as still used by buyers and shippers. The current system used by statistics branch for calculating annual landings from mandatory logs was thought to be inefficient and probably underestimates total landings by about 10-15%. The underestimation is consistent from year to year.

Ross Claytor outlined a project designed to learn more about lobster abundance by conducting short term tag, release, and recovery. It was indicated that this project would not serve as a trade off for future conservation measures. Fishers were in favour of research activities conducted on a more local basis because they feel conditions differ from port to port and recommended that at least two sites be tested. A follow up meeting will be held to finalize details.

LFA 33 lobster workshop, Jordan Bay N.S.
February 19, 2001.

Name	Location
Fred Perry	Ingomar
David Nickerson	Ingomar
Robert Lloyd	Osborne Harbour
James D. Benham	Osborne Harbour
Ernie Pierce	Jordan Bay
Jim Jamieson	DFO
Wilfred Smith	Port La Tour
Allen B. Holmes	NSDFA
Ross Claytor	DFO

Ross Claytor presented an outline of data and preliminary analytical results that would be used to examine associations among fisheries in port clusters 1-13 in LFA 33, catch rates in LFA 41, and the effect of temperature on lobster trap catch rates using the FSRS recruitment trap data.

The presentation on the associations among port clusters began with a description of the number of boats and catch per boat by fall and spring portions of the season in each port cluster. Correlations among the port clusters for catches indicated that port clusters 1-5 and 8-13 formed two groups of associated port clusters with 6 and 7 being intermediate. The only port clusters where fall landings and spring landings were associated were port clusters 6 and 7. Port clusters were grouped into 1-4, 5-9, and 10-13 for catch rate analysis based on voluntary logbook reports for the fall portion of the season. Catch rates in each of these three areas increased appreciably during the fall season in each of the groups. All three groups were correlated for fall season for the years of common data collection.

Analysis of LFA 41 catch rates indicated an increase in catch rates in the most recent year compared to last years analysis. In general Crowell Basin was distinct from Georges Bank in terms of landing and catch rate trends in LFA 41. The other areas were intermediate. An initial look at temperature was inconclusive and more work is required.

The FSRS data indicated that in general for the fall portion of the season temperature influences catch rate and that it might make up to a 5% difference in exploitation rate on average for all areas. Additional work is required to determine the reasons for differences among areas and the uncertainty involved in these estimates. The FSRS data looks very promising as a method for sorting out the relationship between temperature and catch rates.

Industry comments:

- Check on B licenses, Cape Sable island also has about 20 boats that fish in LFA 33 to improve analysis of number of boats
- Remove spring 1998-1999 from analysis it is too low
- No B licenses in port cluster 13

- West Halifax to Lunenburg different from other areas
- Spring season had easterly winds, instead of dividing go into Green Harbour
- Inside fishing was not as good as last year
- Those that stayed inside did not do as well as those that went outside.
- Effort is outside, and farther and farther, baiting is making new bottom
- What is the influence of herring seiner catches on lobster cpue

Appendix 8. Comments on LFA 35 - 38 Stock Status Report

Submitted by Ross Claytor

Andy Gallant, from LFA 35-38, provided a review of the current lobster RAP and expressed the view of his part of the industry on the ability of science to provide advice to managers on the resource. The following is a summarization and paraphrases his comments.

> There is a small amount of information that is being used to predict the fishery. Past processes have not been adequate for providing advice, but it is recognized that recent information will be useful. The process of determining exploitation rate and egg per recruit is dependent on few numbers and poor catch records. If management is to be made on the best guess of what is going on, then industry wants to make the guess.
>
> In the late 80's and early 90's if exploitation rate was 90%, where are the lobsters we are catching today coming from. The calculations and predictions made by science since the 80's have not come to pass. The faith in numbers and predictions made by science is not there.
>
> Egg per recruit is not realistic for management, industry and management must develop a strategy of sustainable resource using indicators that include social and economic factors. Industry is committed to conservation but it must not be heavy handed. It is time for science, management, and industry to work together.

Submitted by Peter Lawton

Although this is not a scientific rebuttal of the SSR process, Industry is convinced we must be more involved in the process that ultimately directs management direction.

Industry is not satisfied and do not feel that Management of Science should be satisfied that the management of our fishery should be determined by the process of the past. (especially since 1995). Only in the past few years have we started to develop helpful information gathering systems.

The process of determining exploitation rates or E/R are so dependant on catch records and very limited sampling that calculations are little more than best guess. If we are going to manage by best guess Industry is better informed to do the guess work.

To underline this point, in Area 36 in the late 80's early 90's a request for a season change was made through the advisory process. This request was denied on the basis that science indicated that exploitation was too high. It was also suggested that carapace size be increased as our fishery was on the verge of collapse. Exploitation at the time was pegged at 87%-95%.

Today's exploitation rate is 49%- 55%.

Since the prediction of doom in the early 90's, catches have increased dramatically. Where are these lobsters coming from?

How can Industry have any faith in the numbers science provides? How can we agree with the decisions management makes with this info? Science does not have solid methods of calculating exploitation and as a result we see great fluctuation in numbers because of the different calculations. The problem is not so much with the method as it is the poor information going into the calculations. There are too many variables for Industry to accept current results.

In my opinion, this SSR is one of the few bright spots that I have seen in my 13 years as part of the advisory process. My opinion does not come from the numbers in this report but rather from the common sense comments we have waited years to hear. Example: SSR page 2.

New special fishery analysis approaches were presented in the assessment. They show promise in providing information on conservation management options that would be more accessible for industry than current targets based on E/R.

Industry's opinion is that it should be based simply on pre-recruit and egg producer numbers. It is the opinion of the vast majority in Industry that through the advisory process a strategy should be developed that will ensure a viable fishery using indicators agreed to by Industry, Science and Management.

The first step in this process is to define "Viable fishery".

What levels of landings are required to maintain conservation and socio economic concerns? Industry is committed to the security of a viable and sustainable lobster fishery. We are, however, not interested in being involved in a process that is "heavy handed" or arbitrary which is the process we have forced into since the 1995 FRCC report. We are hereby stating that we are not interested in agendas of the Ottawa bureaucracy but in the future of our Fishery.

While completing your reports and making recommendations, please do not "make light" the comments by industry representatives.

We understand that in the past Science has been forced to make calculations on stock status without having the resources to develop the information gathering process needed to achieve realistic results. We have lost 5 years that could have been spent working together to achieve the results we are all looking for. Let's not waste more time trying to make decisions on our resource without acceptable processes in place.

Following are some points not previously discussed that have direct impact in the issue of "variables."

- Stable landings since 1945, increase since 1995.
- Effort increases.
- Fishing new bottom. (increase or decrease in effort).

- Closed winter season LFA 36.
- Better electronics. (efficiency)
- Larger faster vessels.
- 75 trap, trap reduction LFA 36.
- More trap hauls?
- Escape vents.
- Trap inefficiency.
- Catchability.
- Scallop closure inside 2 miles April to Jan.
- Weather.
- Aquaculture
- V-notch
- Present increased carapace size. 82.5 mm

These are but some of the issues that must be considered seriously in developing a different set of indicators.

Andy Gallant LFA 36
For Fundy North Fisherman's Association
1879 Rt. # 111
Bains Corner, NB
E5R 1P8
506-833-4603

Maurice Belding, 506-659-3178

April 6, 2001

Appendix 9. Comments Received subsequent to 25 April 2001 Teleconference

Letter

Mr. Robert Oboyle,
Office of the Regional Advisory Process,
Bedford Institute of Oceanography,
P.O. Box 1006, Dartmouth, N.S.
B2Y 4A2, Canada.
May 5th 2001.

Subject - Re: RAP Peer Review: Apr. 3,4 and conference call Apr.27th.
Dear Sir,

- The continuation of the L.F.A. 34 RAP on Friday April 27th took the participants off guard as this time frame was totally out of line for the industry to participate. We have continually insisted to the science department and to D.F.O for the industry to partake in meaningful dialog the meetings have to be in accordance to our fishery.
- Mr. Oboyle, you suggested that the changes requested by L.F.A.34 be submitted in writing. You will find more listed than stated on the phone, as we will once again repeat our concerns for our industry to the science community who most times it seems would rather not here it.
- Only a couple of years ago the lobster industry in Scotia Fundy met with D.F.O. Federal officials and the issue of TRUST was fully debated. It's obvious at times it's still missing.
- The advisory process of L.F.A.34 believes first and foremost that the conservation of our lobster stocks is primary and nothing will divert our attention from this serious matter.
- The egg per recruit model used – is not supported by industry and some of the science community, Re: Mr. Bob Miller, "Mr. Gerry Ennis D.F.O. St. John's" and Dr. Bob Bayer are three that have voiced there opposition and no doubt others. Why is it continually being used other than to try to bluff the fishing industry and to gain seven to nine years free time or could it perhaps be to satisfy plans by others?
- You cannot use a blanket plan for the lobster fishery in all of Atlantic Canada.
- L.F.A.34 has the largest fishing area of any L.F.A. 21000 square kilometers of ocean bottom of which a huge percentage is fishable compared to other areas that can only be fished a couple of kilometers from shore due to grounds unsuitable to lobsters.
- The F.R.C.C. and the science department have continually over looked and have refused to allow credit in areas of importance.
- The science department refuses to give credit to the closed area of Browns that the industry strongly believes benefits the L.P.A. of the Gulf of Maine.
- Science have been saying for over 20 years that the lobster fishery is going to collapse, a measure increase was required and talked about then, again 10 years ago and implemented in 1999. If science was right 20 years ago and 10 years ago why didn't the industry collapse?
- Science seems unwilling to believe the industry when it reports the sign of juveniles and seeded lobsters are overwhelming. Why are there so many seeded lobsters? One fisherman so far this season has v notched over 1300 egg-bearing females. Why? What's changed?
- There are concerns if the ocean bottom gets too saturated with lobsters? What does happen?
- V notching is the best thing for conservation and stock enhancement since sliced bread but what did science do? They badmouthed it and why? First, other sectors of the lobster fishery and with the assistance of Dr. Bob Miller promoted the idea that v notching would create bacteria and disease, why? The State of Maine have been v notching for over 75 years, science here in CANADA knew all about this but still tried to discredit the L.F.A.34 industry and the conservation workshop participants. Why? V notched lobsters was tested at the P.E.I.

Veterinarian College for bacteria and or disease. The v notch was proven not to harm the animal and or create disease or bacteria. One would only have to look at the cull % in St. Mary's Bay to prove that lobsters to a degree are crushed, have lost or damaged parts and have not developed bacteria or disease here in S.W. Nova or in Maine U.S.A.

- We have stated for years that the only requirement for industry to enhance itself would be for the enforcement of D.F.O. to do away with the illegal fishing. so therefore do its job.
- Near shore area account for over 90% of the catch in 99-2000 pg.4. With that being the case what is the panic of the mid shore fishery being a refuge? It was mentioned during the call that in the mid 70's 14 to 18 lobsters per crate. Well if science isn't seeing this now we would suggest you re not looking at the right place as these huge animals are still being caught. These lobsters will only be caught in warm water. We also know these animals were targeted by the off shore until recently.
- Don't forget there weren't any lobsters in the mid shore the fall of 99 – 2000 season. Why?
- Were these the animals that made the 90% near shore look so high?
- Statistics are still out but this past fall the select lobster was 30% of the catch in most areas including the near shore area. Why?
- Page 5 last paragraph - in L.F.A.34 84% landed are new recruits in the 81-94 mm CL size. As stated on the call wherever the Min. size is that's where you will find the largest % of landings. This has always been the case and to say otherwise would be very misleading.
- Management Considerations re. F.R.C.C and E/R. page 9-Not to repeat ourselves we do no believe in this model.
- Page 10, outlook second paragraph, line before the last. At the end of the sentence – landings have remained high in the 1990's. Put a period here at the end of 1990's. Delete the rest of the sentence.
- Delete the next paragraph – Increases were observed etc.
- The following paragraph after the word unfished at the end of the fifth line add "by L.F.A. 34 fishermen" may result etc.
- When you observe the L.P.A. Gulf of Maine catches escalating higher each year you have to wonder in amazement how the fishery keeps getting better. It's time that v notch be given the full credit it deserves.
- Just perhaps the larvae created by the v notch in Maine have a greater influence on the recruitment in the Gulf of Maine L.P.A. than could ever be imagined.
- A few examples of conservation in L.F.A.34 are.
- L.F.A. 34 has been V-Notching for three years.
- L.F.A.34 have a season fishery of approximately 6 month.
- L.F.A. 34- trap limit of 375 in the fall and 400 in the spring.
- L.F.A.34 limited license entry of 968.
- L.F.A.34 has the harshest season of any L.F.A; last Monday in November till the last day in May except for L.F.A.38 has practically the same season with the exception they have the month of June to fish.
- L.F.A.34 having the above season means the harsh weather becomes a conservation tool as some of the license holders only get out fishing 70 to 90 times out of approximately 180 fishing days. This alone creates less effort. You cannot compare the winter fishery to a L.F.A. who have a summer fishery.

- Biodegradable fasteners "iron hog rings" on the escape panel are required so the panel falls off of a lost trap so it doesn't ghost fish.
- The environment plays major roles in the reproduction of all sea life and we should not forget we have not had a hurricane in many years. Most can remember picking up ½ ton truckloads of washed up lobster on the beaches. If this occurs to the larger lobster what does it do to the small class 4-5 etc
- Science may have done cod stomach analysis and found no lobster; well we the industry believe cod is a predator and right now it goes without saying cod stocks are low.

Realizing some of the items were not mentioned at the RAP we believe they play a major role in the scheme of the abundance and the continued growth of our lobster industry.

We would like to thank the R.A.P. committee for allowing us the L.F.A.34 committee to submit our rebuttal in writing and behind schedule.

Best regards;

L.F.A.34 Lobster Advisory Committee.

Reply

Tail-notching would promote disease: Some lobster buyers opposed tail notching because they thought there was a risk of disease and because the notched shell would decrease the lobster price in some markets. Until recently I did not know of any studies determining the risk of disease from tail-notching and didn't predict any effect of tail notching on disease. AVC has recently completed a study at a particular time and location in the Southern Gulf and found no evidence of disease. The study appears to be well done and I accept the results of that study.

The egg per recruit model used is not supported by industry and some of the science community. My main criticism of egg per recruit has been that a single target value should not be applied to an entire fishery. However, the DFO Minister's announcement states that egg per recruit should be doubled from existing values. A single value has not been chosen for fishery-wide application.

Bob Miller